Understanding unrecognized galaxy blends with photometry

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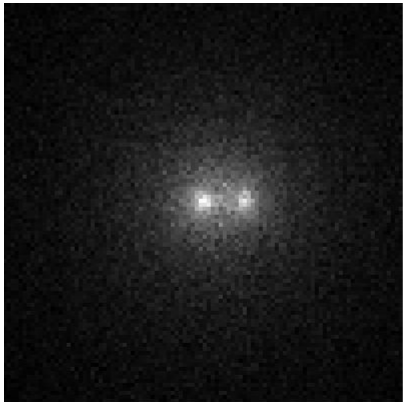
The problem

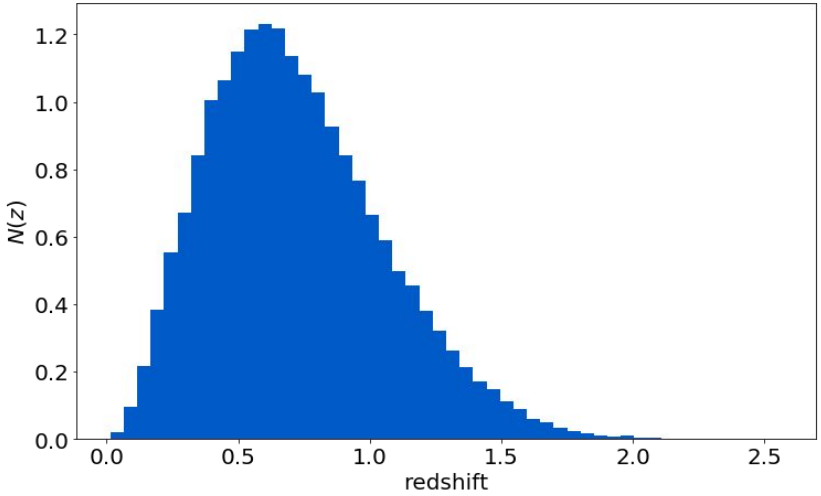
In current and upcoming surveys, many galaxies will be *blended*.

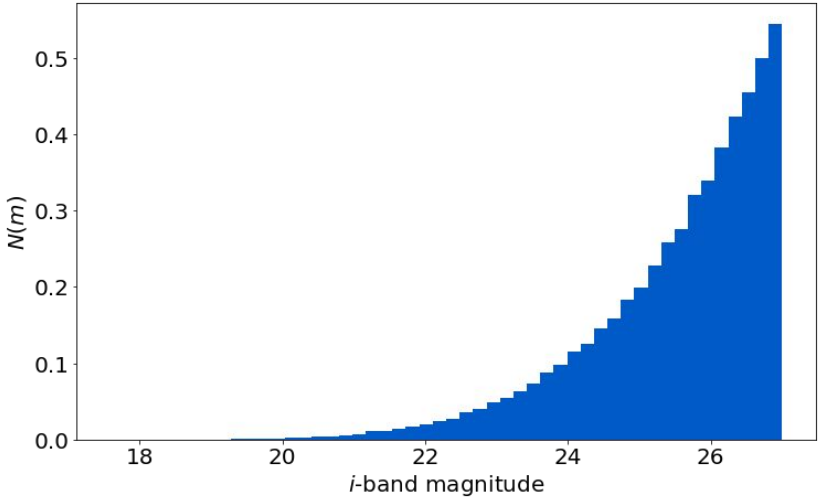


Can we detect previously-undetected galaxy blends using their colors?

Toy-model simulations

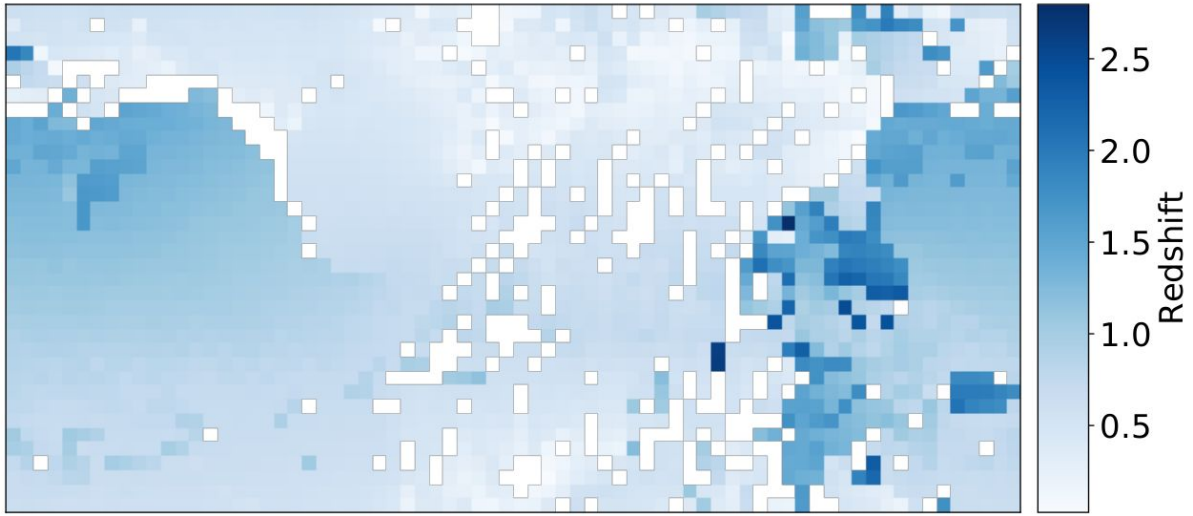
- Randomly draw two numbers from a redshift distribution
- Randomly draw two templates for galaxy spectra (Brown et al 2013)
- Randomly draw two magnitudes
- Redshift the spectra to the right template, get the flux in LSST bands (ugrizy)
- Add the fluxes
  - Note: no extinction in following plots (active work)





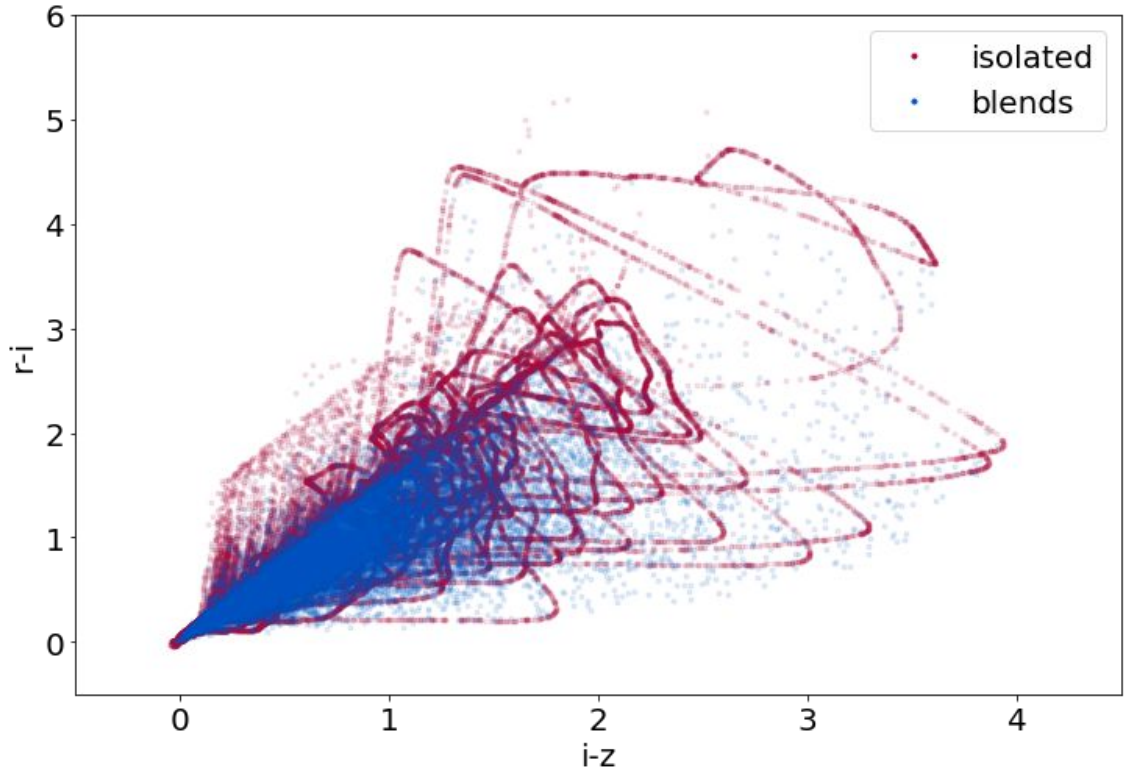
A quick tour of self-organizing maps

A self-organizing map is a 2D representation of a high-dimensional manifold.



See: Geach 2012, Carrasco Kind and Brunner 2014, Masters et al 2015 & refs

First question: do galaxy blends have unique colors?



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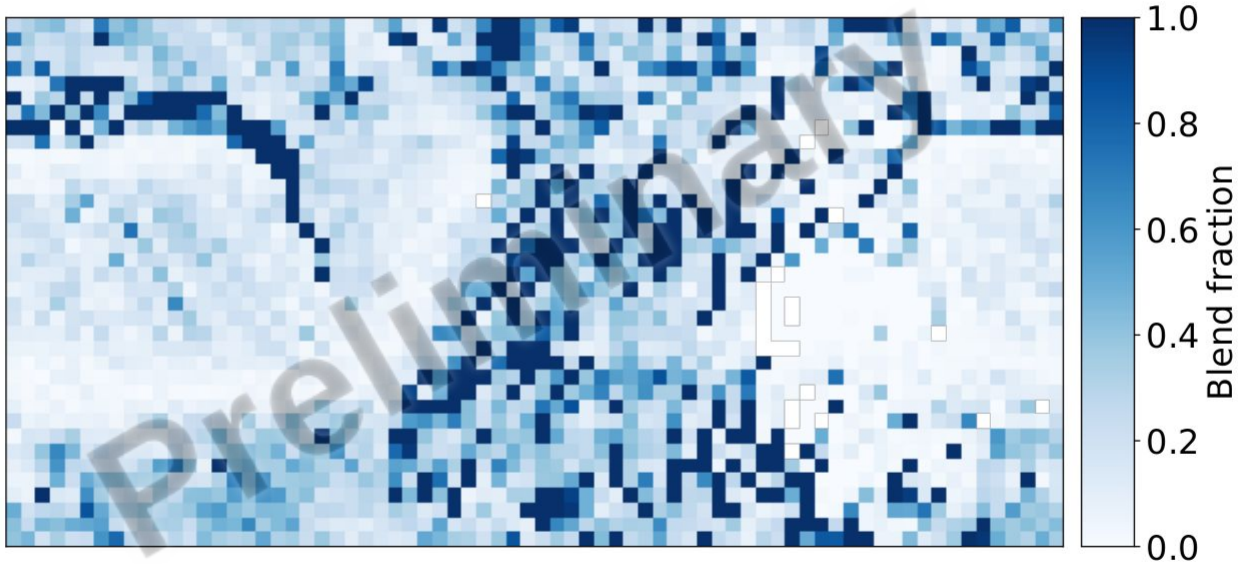
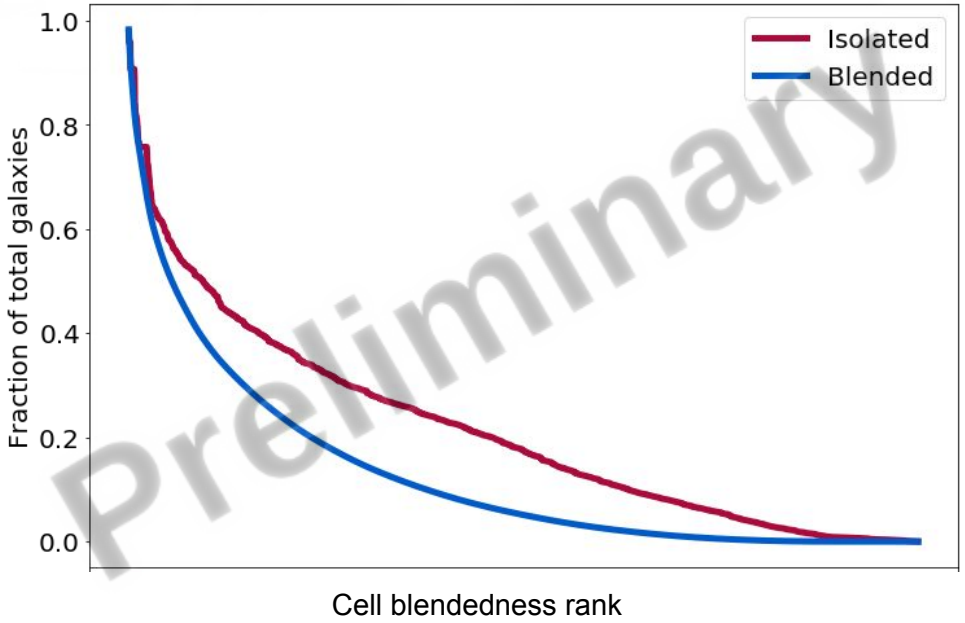


Yes, but…

First question: do galaxy blends have unique colors?

...that was with no photometric noise.

Second question: can we make clean samples?



Depends on fraction of things that are blends, but probably also **no**.

Third question: can we measure the unrecognized blend fraction?

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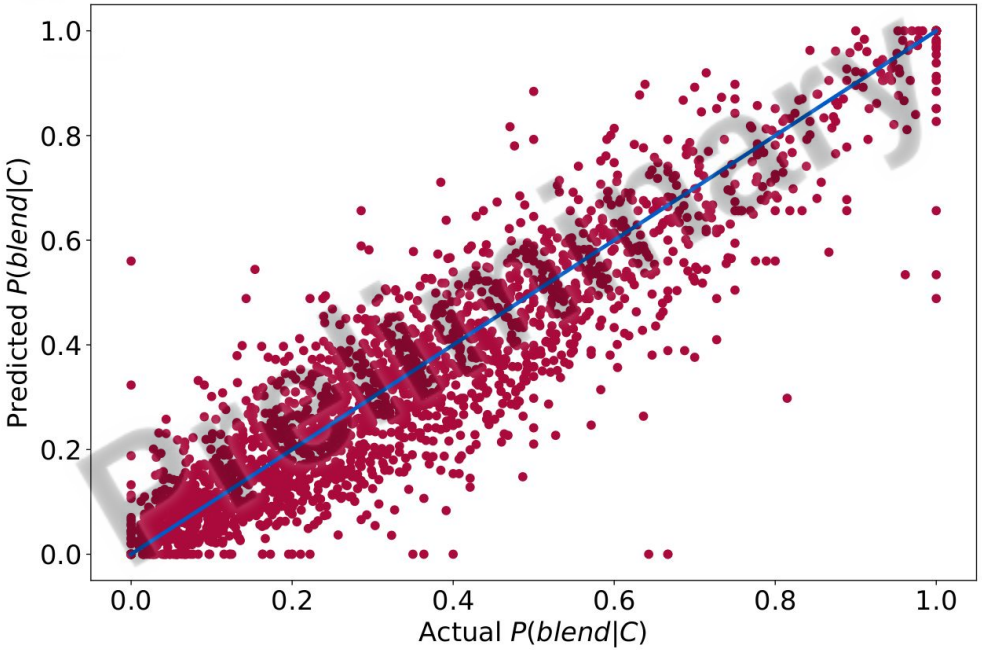
Promising, but noisy…

(As a whole, this predicts 0.323 instead of the expected ⅓))



Summary

- We cannot detect individual unrecognized blended galaxy pairs in the presence of noise
- But, we may be able to statistically describe the fraction of detections that are unrecognized blends--either for the whole sample, or for subregions of color space.
- Ongoing work:
  - Extinction
  - Realistic distribution of galaxy types
  - Lensing-conscious weighting
  - Cosmic variance